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Changes in Respiratory Systems in Adolescents during Physical Activity in Hot Climate Conditions

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Abstract: This article discusses changes in the respiratory systems of adolescents during physical activity in a hot climate. An integrated approach is being studied in the study of age-related features of changes in the activity of external respiration systems, gas exchange and energy metabolism in children and adolescents in the hot climate of Uzbekistan.

Keywords: physical activity, adaptation, gas exchange, oxygen, flexibility, mobility.

Introduction. The rate of change in body size, functional characteristics of organs and systems do not remain constant throughout the individual development of the organism, but change regularly [1, 2]. The study of the activities of various functional systems of adolescents in changing environmental conditions is relevant not only because the developing organism of the child is largely influenced by it, but also because these effects largely determine the course of its further development [3, 4]. Stressful stimuli of the external environment, including muscular work, change the magnitude and nature of the adaptive reactions of the child's body [5, 6, 7].

Broad and comprehensive studies of the age-related characteristics of the body's adaptation to the conditions that arise when performing intense physical work, the displacement of ways to expand the functional capabilities of a growing organism and the possible range of its fitness continue to be relevant [8, 9]. Adaptive capabilities of the organism of children and adolescents to the effects of several vital systems operating on the principle of self-regulation, which include systems of gas and energy metabolism and respiration [10, 11]. Human breathing is associated with physical performance and reflects the overall activity of the central nervous system, the state of tension in the body, and the maximum air flow during inhalation and exhalation makes it possible to indirectly judge the ability of the respiratory muscles to work intensively [12, 13, 14].

An integrated approach was used to study the age-related characteristics of changes in the activity of the external respiration systems, gas exchange and energy metabolism of adolescents in the hot climate of Uzbekistan when performing muscle loads of various nature, volume and intensity [15, 16]. The intensity of metabolism and energy is associated with age, nutrition, muscle work, and environmental changes in the environment [17, 18].

Anthropometric data, indicators of external respiration and physical performance in schoolchildren of grades 8-11 were registered. The subjects were teenagers living in the city of Termez.

The results of the study showed that the frequency of respiratory movements in schoolchildren decreases with age, and the vital volume of the lungs increases [19]. The maximum oxygen consumption during the performance of dosed physical work among schoolchildren decreases after school hours.

It has been established that age-related changes in the parameters of energy metabolism and external respiration are characterized by a consistent increase in their

absolute values due to the increase in body length and weight in the increasing need of the body for oxygen [20, 21].

The data of our studies confirmed the opinion that with age and an increase in the level of preparedness, natural shifts occur.

in the respiratory system, gas exchange and energy exchange, indicating an increase in their efficiency in conditions of relative rest and muscle tension [22].

In adolescence, characterized by intensive development of muscles and the effective influence of physical exercises on this process, a gradual increase in the latter in the daily routine of schoolchildren, as well as an increase in their volume and intensity in physical education lessons, should be recommended. It should be emphasized that the specified introduction of physical exercises into the daily regimen and an increase in motor activity should take place with the obligatory consideration of age-sex characteristics and the level of preparedness of schoolchildren, as well as with systematic medical monitoring of the state of health and the degree of exposure to muscle loads of increased tension [23, 24].

In the course of the study, the age and gender boundaries of the responses of the growing organism to the proposed muscle loads were revealed. The direction of changes in these reactions has been established, which manifests itself in the fact that with age, the responses of the body of children and adolescents to a load of the same power become less pronounced. This fact can be regarded in such a way that in the process of growth and development of the organism, its adaptive abilities are improved and mobilization capabilities increase.

In addition, this indicates the improvement of the neurohumoral regulation of motor and vegetative reactions both at the level of organs and systems, and at the level of the whole organism. At the same time, it should be emphasized that boys show better adaptive-mobilization abilities, expressed in general and special economization of motor acts and lower energy consumption for their implementation. Senior school age, characterized by a high level of development of energy supply systems, resistance to oxygen deficiency, which should be considered the most optimal for including long and fairly intense physical exercises in the daily routine. The latter is especially favorably reflected in the education of endurance.

The study of the age and seasonal dynamics of external respiration and gas exchange during the performance of training loads of increased volumes and intensity allows us to note the flexibility, mobility and high variability of the adaptive mechanisms of these body systems. At the same time, the process of adaptation of functional systems to intense muscular activity in physically more prepared schoolchildren is carried out not only by expanding the functional capabilities of the body, but also by increasing its resistance to oxygen deficiency, which turned out to be maximum in younger schoolchildren.

Conclusions. The obtained experimental material convincingly indicates that in ontogeny the energy supply of muscular activity is rearranged in a certain way. The opinion of some scientists was confirmed that the primary school age, when performing muscular work, is distinguished by specific functional capabilities, manifested by a high level of development of tissue oxidation systems and the presence of adaptive mechanisms that allow intensive oxygen supply to working tissues.

Thus, the study of the age characteristics of energy metabolism and external respiration of children and adolescents living in a hot climate region made it possible to characterize the organization of metabolic processes at rest and during muscle activity.

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